Environmental Health
PERSPECTIVES
Journal of the National Institute of Environmental Health Sciences

ehponline.org

Meta-Analysis of Dioxin Cancer Dose-Response for Three Occupational Cohorts

Kenny S. Crump, Richard Canady, Manolis Kogevinas

doi:10.1289/ehp.5831 (available at http://dx.doi.org/)
Online 30 October 2002

The National Institute of Environmental Health Sciences
National Institutes of Health

Meta-Analysis of Dioxin Cancer Dose-Response for Three Occupational Cohorts

Kenny S. Crump[1], Richard Canady[2], Manolis Kogevinas[3]

[1]Environ International Corporation
602 East Georgia Avenue
Ruston, Louisiana 71270
Tel. 318-251-6085
Fax: 318-255-2040
Email: kcrump@environcorp.com
(to whom correspondence should be addressed)

[2] Center for Food Safety and Applied Nutrition
U.S. Food and Drug Administration
5100 Paint Branch Parkway
College Park, MD 20740-3835
Tel. (after 02/15/02) (301) 436-1944
Tel. (until 02/12/02) (202) 205-0136

[3] Respiratory and Environmental Health Research Unit
Institut Municipal d'Investigació Mèdica (IMIM)
80 Doctor Aiguader Rd.,
Barcelona 08003, Spain
Telf. +34-93 2257568
Fax: +34-93 2216448
Email: kogevinas@imim.es

Running Title: Cancer Dose-response Assessment for Dioxin

Key Words: dioxin, dose-response assessment, meta-analysis, carcinogen, occupational cohort

Acknowledgments

The authors would like to express appreciation to Drs. J. Alexander, J.D. Wilson, and M. Zeilmaker for helpful comments early in the development of the analysis presented here. Appreciation is also expressed to Dr. K. Steenland for helpful discussions and for providing a computer program used in one of his analyses. Partial support for this work was provided by USEPA.

List of Abbreviations

TCDD - 2,3,7,8-tetrachlorobenzo-p-dioxin

USEPA – United States Environmental Protection Agency

CI – Statistical confidence interval

NIOSH – National Institute for Occupational Safety and Health

SMR – Standardized Mortality Ratio

CSLC – Cumulative serum lipid concentration

TEQ –the amount of TCDD that would produce the same toxicity as a mixture of TCDD-like compounds (unit of measurement for TCDD-like compounds)

ED_{05} – Effective dose 05, exposure predicted to result in an increase in the lifetime probability of cancer of 0.05.

Outline of Section Headers

Abstract

This paper presents a meta analysis of data from three cohorts occupationally exposed to TCDD and related compounds. A statistically significant ($p = 0.02$) trend was found in total cancer mortality with increasing dioxin exposure. The trend tests show an increase in total cancer at cumulative TEQ serum levels that would result from lifetime intake of 7 pg TEQ/kg body wt/day, with no increase at 6 pg/kg/day. A linear dose response provided a good fit to the combined data, and predicted an ED_{01} (dioxin exposure resulting in a 0.01 increase in lifetime risk of cancer mortality) of 45 pg/kg/day (95% CI: 21, 324). USEPA estimates that current lifetime human exposures to dioxin average approximately 1 pg/kg/day (99% percentile 3 pg/kg/day). Although it appears unlikely that current exposures through foods would reach either 7 pg/kg/day or the ED_{01}, our analysis argues for careful consideration of the upper ranges of long-term average exposures for dioxins..